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AMERICAN JOURNAL OF PHARMACY

AND THE SCIENCES SUPPORTING PUBLIC HEALTH

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OUR COVER

DR. WILMER KRUSEN

BORN in Bucks County, Pa., May 18, 1869, Dr. Krusen's education was acquired in that community, and his professional training began in a pharmacy in Newtown. He graduated from Jefferson Medical College, Philadelphia, in 1893, remained to teach there for a time, and then became associated with the Medical College of Temple University, where he rose to the position of Professor of Gynecology. He is now Honorary Vice-President of Temple University.

A constant advocate of the beneficial results of adequate public health service in the community, Dr. Krusen put his beliefs into practice during his two terms as Director of Public Health of the City of Philadelphia. Recently, he was chosen Honorary Chairman of the exercises marking public health day in this city, indicating the esteem in which was held his outstanding administrative ability in public office.

In 1927, Dr. Krusen was elected President of the Philadelphia College of Pharmacy and Science, to succeed Admiral William C. Braisted, retired. His leadership in the work of that pioneer educational institution won for him the unstinted praise and admiration of all with whom he came in contact. Illness forced his retirement early this year. The members of the College created the post of President Emeritus, and appointed him to this position, so that the institution might continue to receive as much as possible the benefits of his wise counsel and advice.

E D I T O R I A L S

THE SULFATHIAZOLE INCIDENT

Here you may read the editor's thoughts on timely topics,—opinions unprejudiced and unrestricted.

EVERYONE who has even most casually scanned the pages of the pharmaceutical press within recent months is well aware of the facts of this case and yet there are certain aspects of the affair that are not appreciated nor even considered.

Intelligent comment has drawn a sharp line of distinction between this error and the one which is credited with bringing about the new Food and Drug Act. In the first place this mistake is not unlike similar ones made every day in all fields of endeavor. It was apparently one of those occasional mechanical errors made by everyone at some time or another. If, instead of phenobarbital, the foreign substance had been any *harmless* chemical, *what a difference it would have made* and yet strictly speaking the error would have been just as great. Of course, control methods might be expected to uncover this oversight and yet the very lack of uniformity within the tablets of a single batch could, by a most unfortunate coincidence, permit the situation to escape detection. A control procedure cannot assay every tablet made, but only a *representative* sample, and where a batch varies widely it is possible that a *perfect* sample might have been selected.

The pharmaceutical profession is indeed unique among those engaged in forwarding public health. Its errors continue to live, welcoming all persons bent on detecting them. Because of these things some persons are led to believe that our errors are legion. Actually, if all the facts were available, we would wager that by this very token our mistakes are far less in number than those committed in other health fields wherein detection is not easily possible.

It should be understood that we do not condone errors—we dislike them and fear them more than anything else. Accuracy has always been a by-word in pharmacy. We teach it, we preach it, and we try to make it the pattern for all our procedures. Yet we know, and all fair-minded persons admit, that since pharmacists are but human an occasional mistake will occur.

The proposal that further governmental regulations are needed to prevent a recurrence of such incidents is like proposing a law forbidding all people to touch hot objects. Pharmacy instinctively recognizes the need for accuracy and events which so vividly call attention to an error do harm not to one company alone but to the entire industry. As has been very aptly stated "The company making such an error will probably be the most exacting in the entire industry for years to come"!

No, it is not regulations that are needed, it is simply an unending and tireless pursuit of the control methods already implemented by all responsible companies; tedious and careful analyses, an elaborate control procedure, and close supervision by technically trained personnel over all workers in production departments.

We cannot hope to achieve perfection, but by striving toward that goal we shall at least bring our mistakes to a minimum. Nowhere is the saying "Eternal Vigilance is the Price of Liberty" more true than in pharmacy.

L. F. Tice.

THE SHORTAGE OF PHARMACISTS— A BLESSING OR A PROBLEM?

IS there a placement officer in a college of pharmacy or pharmaceutical association who has not written a letter something like this in the past few months?—"We are sorry that we cannot comply with your request to supply names of pharmacists seeking employment. At the present time we have no one available who might meet your qualifications. However, we are filing your letter where it may be seen by anyone coming to this office in the near future looking for a position." Very likely, such messages have become so commonplace with these officials that they have adopted a suitable form letter to save the time involved in individual dictation. Telephone calls and personal visits from would-be employers must be answered in similar vein.

As the requests continue to roll in, and as the regrets continue to be sent out, the harassed middleman, the placement official, begins to realize that something radical is happening. No longer can he refer five, six or seven names to pharmacists, manufacturers and hospital superintendents seeking professional aid. Now he watches

men and women changing from one position to another because of better working conditions and greater opportunities for advancement. At last the pharmaceutical graduate is coming into his own. Yes, there seems to be a shortage of pharmacists, even as it was planned and hoped for when the academic qualifications for entrance into the profession were raised some years ago.

But one State journal (New Jersey) comments editorially on "The Shortage(?) of Pharmacists", and the American Journal of Pharmaceutical Education asks "Is There a Shortage of Pharmacists?" The writers of these editorials openly question the point, stating in rebuttal that there are already too many pharmacists (approximately 100,000 in 58,000 drug stores) for the common good of pharmacy, and asserting that it might be beneficial to all in the profession if a few of the smaller stores were forced to close through lack of qualified help.

On the other hand, the National Association of Retail Druggists endorses Fair Trade legislation so that these marginal stores might stay in business. But the little fellow who has felt the benefits of such laws now finds himself able to employ more professional help, and is chagrined to learn that no such help is available.

It is all very confusing, as is every transition period to those who experience it.

We like the Jersey writer's argument that a weeding out of the weaker ones will allow those who have invested considerable sums of money and four or five years of their lives in education "to practice the profession for which they were schooled. Nobody will be out of a job and the 'drug business' will consist of the practice of pharmacy without encroachment upon the domain of the butcher, baker and candlestick maker." Hasten the day!

We like, too, the pedagogue's warning that a shortage of pharmacists might lead to a lowering of educational and moral standards and a lessening of the training period in order to turn out more men and women to take up the slack. This, of course, must be prevented at all costs.

And so, out of the confusion of thought and division of sentiment, definite facts are crystallizing.

It is most certain that the properly qualified pharmacist can take the position of his choice today. In addition, there are many unfilled positions for pharmacists who have met the state board re-

quirements. This is more true in certain portions of this country than in others. A severe drop in college enrollment, the Selective Service Act and the prestige and standing now to be gained by those who wish to volunteer their pharmaceutical services to the armed forces of the nation will do nothing to alleviate the situation in the near future. Rather it will probably become accentuated. There will be agitation to reduce the standards. There will be a hue and a cry that pharmacy cannot serve the public in the style to which the public is accustomed if more help is not immediately available. Some stores will close, or will violate the laws as to the constant presence of registered pharmacists. Those who state that there is a shortage of pharmacists will be more correct than ever, if a shortage is defined as the inability to fill all positions regardless of their remuneration or actual need for pharmaceutical service. Those who say there is no shortage will continue to make this assertion without much concrete argument to the contrary, for the lessening of the number of pharmacists may not be very apparent to the general public.

And so, as we take stock of the changing situation at this moment, we find that we must guard against any bitter disagreement over a relatively minor point. Each side must recognize the actual facts of the case, and all must come into agreement on an acceptable definition of the term "shortage." Beyond that we must, as has been urged by others, resist any return to the lower standards of old, for these were found to be faulty standards. There must not be too much anguish when experienced professional help is not immediately available.

Rather pharmacists, generally, must recognize that this present condition is exactly what was planned when the educational standards in pharmacy were raised some years ago. If we were to continue to supply pharmacists at the same rate as a few years back the status of the profession would never be raised to that level for which all of us are striving.

Yes, there is a shortage of pharmacists, and a very real one. There is, however, no cause for immediate alarm, unless, through some unforeseen event, the wholesale diversion of present-day graduates and students into other fields should prevent their filling a place in the field of pharmacy. As long as the public receives adequate pharmaceutical service these readjustments and reallocations within our profession are both desirable and healthy.

JOHN E. KRAMER.

INSECTS ARE COSTLY ENEMIES

Insects are relentlessly fighting against man both socially and economically. It has been said that without control measures insects would eventually crowd man off the earth. Written by an entomologist actively engaged in insect control, this article presents an interesting discussion of this timely topic.

By C. A. Thomas

WARS and threats of war come and go in Europe, Asia and Africa. Vast army and navy maneuvers, costing many millions of dollars annually, are staged in this and other countries, to prepare for a possible invasion. Yet we complacently overlook the fact that we have already been invaded by an enemy; that right at home, on our farms, in our gardens, even in our houses, are tiny insidious "fifth columnists" that are busily engaged in destroying the works which man has been at such great expense and labor to grow or to erect. I refer to the vast army of insects, those multitudinous foes which are actually destroying more than two billion dollars worth of our crops and products every year. From ten to twenty per cent. of our annual crop production goes to satisfy the ravenous hunger of our insect pests, and they are still not satisfied, for they are rapidly adapting themselves to new food plants, and spreading over our country to cut down the supply of those plants upon which they are accustomed to feed.

Reasons for the Increase in Insect Damage

Why this increasing destruction by insects? Older farmers say that years ago all they had to do was to prepare their soil, plant their seed, and the crops would almost take care of themselves until harvest. Nowadays, most agriculturists do not expect to obtain a good crop of vegetables or first quality fruit unless they put on an intensive spraying campaign. The reasons for this are undoubtedly many, but the following are important factors: Up to date, over six hundred thousand different kinds or species of insects have been found and classified throughout the world. In the United States over six thousand species have caused at least some damage. About

forty species of insects in this country cause over nine hundred million dollars worth of damage every year. And more than half of this latter group are foreign pests which have accidentally been brought into this country on plants imported from abroad. The worst North American pests are these foreigners, which include the Japanese beetle, the European corn borer, the Mexican bean beetle, the cotton boll weevil, the Hessian fly, and many others. Most of these aliens have entered the United States within the past seventy-five years, and some within the past twenty-five years. With this vast influx of new pests, the farmer is certainly justified in saying that he has many more insect troubles than his father ever had.

But it is not only that insects have increased in variety here. Conditions for increase in numbers have actually been made more favorable for them. The clearing of land has driven many insects, which formerly fed only on weeds, to attack and acquire a taste for cultivated plants, and growing these plants in large groups has provided a veritable feast for these creatures. In Japan the Japanese beetle has about one hundred food plants; over here it has learned to feed on about two hundred more varieties. Thus it is evident that man, in extending his commerce around the world, and in his intensive methods of agriculture, has actually encouraged the insects to a certain extent. In other words, man is sometimes his own worst enemy.

It must not be overlooked, however, that probably the chief factor in the great insect increase lies within these creatures themselves. Tiny though most of them are, insects are much more prolific than higher forms of animal life, and this has enabled them to survive unfavorable conditions throughout the ages, when other animals have been exterminated. Some insects, as the aphids or plant lice, have as many as fifteen or more generations in a single year. Since each aphid can produce from twenty to fifty young during its short lifetime, it is evident that an enormous number would accumulate by the end of the season.

How Nature Attempts to Control Insects

However, that insects do not cause much more injury we may thank natural control as well as man's own efforts. Nature here enters the picture and balances its budget, for most insect species have diseases, parasites or predators which feed in or on them and destroy

them. Even the tiny aphids have smaller parasitic wasp enemies which lay eggs within their backs. The larva or worm hatching from these eggs eat out the interior of the aphis, then change to a wasp, emerge through the aphid's back, mate, and continue to lay eggs in other aphids of the same species. In this same way, when the citrus industry was threatened some years ago by a species of scale insect, it was successfully controlled by importing from Australia a species of lady bug beetle which practically eradicated the scale within a couple of years. Parasites of the Japanese beetle and of the corn borer have been brought into this country from the native homes of these insects, and some of these parasites are becoming established here and are aiding in the control of their hosts.

In addition to insect parasites, insect pests are also attacked by fungous and bacterial diseases somewhat similar to those which cause human diseases. A bacterial disease recently developed against the Japanese beetle is having excellent success in many places where it has been tried. Weather conditions, such as driving rains, droughts, rapidly changing temperatures, also kill many insects, but few insects are actually killed by cold snowy winters except those living above ground. Those that hibernate in the soil are protected to a large extent by the snow blanket, for the temperatures under the snow are many degrees higher, and less changeable, than those above the snow.

Birds eat a vast number of insects, especially during the nesting season, and even the much maligned crow and starling have been seen to eat many pests. Toads, frogs, and even snakes are great insect eaters, while the skunk actually enjoys digging Japanese bettle grubs out of a lawn or golf course.

How Insects Affect All of Us

The housewife, the doctor, or the builder may say "all of that information may be of interest or use to the farmer or to the gardener, but just how does it affect me?" Omitting at this time any discussion of the relation of insects to the food supply, and of the supply to the cost of food to the consumer, which includes the housewife, the doctor and the builder, let us discuss some of the ways in which insects are of direct concern to those persons.

Some knowledge of insects is useful to the housewife, for there are many pests which live in dwellings. From the meal worm and

the flour weevil in the meal, flour and breakfast food; the moth larvae and beetles which eat dried fruits, clothing, carpets and rugs; the roaches and ants which cause annoyance in the pantry or on the kitchen table, to the more serious problem of bedbugs, fleas, flies and mosquitoes which annoy by day and by night, the lady of the house is frequently confronted with insect problems which may seem impossible to solve. Yet, if she knows each of these pests when she sees them, knows how they live and how they feed, and is willing to pay the price of vigilance and perseverance, she can free her home from them. It is no disgrace to find insect pests in a dwelling, but it is decidedly a reflection on one's housekeeping to let them stay there without any attempt at eradication.

The doctor has a definite interest in insects because of the proved transmission of certain diseases by these pests. Yellow fever is transmitted only by certain species of mosquitoes, and must undergo part of its development within the bodies of these insects before it can be passed on to humans. Malaria is also carried only by certain mosquito species. Bubonic plague, the scourge of many tropical countries, has been greatly lessened by using the discovery that this disease is transmitted to humans from rats via fleas. Hence rat eradication has minimized the disease. The typhus fever of Europe is carried by body lice, and one of the reasons it made so little headway among the allied armies during the world war was because of the delousing methods used by those armies.

The true Sleeping Sickness of Africa is spread by the Tsetse fly, and kills many people every year. Typhoid fever is sometimes spread by house flies, and anyone who has followed the development of these dirty insects in manure piles or outhouses, and has then seen them alight on the food on our tables, fall into the milk, or crawl on the baby's bottle, realizes their potentialities for spreading many intestinal, respiratory and other diseases. Recently there have been a number of cases of spotted fever in this section; this disease is carried by the dog tick and has caused considerable concern among medical men. Even the tiny Phorid mushroom fly has recently been found to cause a type of allergy among certain mushroom growers.

The cattlemen of the south and west, and the dairymen of the eastern United States, have reasons to fear insects, for several species of flies produce eggs and grubs which enter the food canal of their cattle or bore out through the muscles and ruin the hides, in addition to the great discomfort which they cause to the animals. Flies annoy-

ing dairy cattle have been found to lower milk production as much as ten per cent. during the summer months.

Lumbermen, architects, carpenters and builders have an interest in insects, though many of them apparently do not realize this fact. Many kinds of boring insects live in trees, feeding on the cambium layer until they have girdled and killed the tree, or digging directly into the heartwood. Such insects frequently do more damage than forest fires in certain areas, and such dead or weakened trees are a fire hazard at any time.

After the wood is prepared and placed in the building it is still subject to insect damage, for the so-called "white ant" or termite can work its way up into the woodwork wherever this has any connection with the soil, and often entirely eats out the interior of rafters and other timbers, leaving only a shell. In some parts of the south, building codes require a metal plate on the basement wall to insulate the woodwork from the soil below.

It is well to again note that the greatest monetary damage by insects is undoubtedly to growing plants. Then why should the pharmacist, who probably lives and has his business in the city or in a smaller town, and who probably has little direct contact with agriculturists, be interested in insects and their control?

During wars and depressions, economic conditions become difficult, people move from urban to rural communities and raise much of their food in war or depression gardens. Insects are favored by these small plots of food plants, and thrive there unless checked by dusts or sprays. In the cities, in order to reduce expenses, families "double-up" or live together. Under such conditions sanitation may become lax, and bed bugs, lice and flies steadily increase. The pharmacist can increase his sales of fly sprays, garden sprays, and similar materials during such times if he is alert to the insect problems of these people. In addition to just selling them the materials, however, he should know the difference between the various pests, and should be able to give information and service which will really be to the advantage of his customers. Too many druggists know very little about the pests for which they sell insecticides, and several instances of poor judgment regarding such materials have been observed. Why shouldn't the druggists be able to give intelligent assistance to his clients, instead of just selling another patented insecticide, hundreds of which are on the market but many of which have little value against the insects for which they are recommended?

To assist the pharmacist to familiarize himself with insect control as now practiced, there is appended to this article a list of reviews and summaries which will give him a comprehensive survey of the subject of insecticides, without consuming too much of his time.

Man's Attempts to Control Insects

We have noted above that mankind in all walks of life is subject to the ravages of insects, and that nature has developed some enemies of these pests which help to counteract them. However, these factors of natural control are rarely effective in entirely eradicating a pest, and man has had to come to the assistance of these natural control agencies by changing or manipulating his methods of agriculture or by developing insecticide materials.

The subject of the use of farm practices is so extensive that they will not be discussed here except to list a few of them. Among the more important practices of value against insects are destruction of all weeds, rubbish, stalks and stubble in the fall, to prevent insects from carrying through the winter in this material; this destruction is accomplished by burning or plowing under. Crop rotations are also of much value, particularly against those pests which are restricted to plants of a certain family, or to only one or two host plants. Careful fertilization and cultivation of crops will sometimes so stimulate the plants as to enable them to outgrow any insect injury. At present much attention is being given to developing resistant varieties of plants which will be less attacked by insects.

The Use of Insecticides

Roughly speaking, the insecticides now in use may be divided into the three groups of sprays, dusts and fumigants. During the development of these materials it has been found necessary to study the make-up and biology of the various economic pests; if a knowledge of these is necessary to the chemist or entomologist who developed the insecticide, it is even more important to the agriculturist who buys these materials and attempts to use them. Therefore the following pertinent facts regarding the general anatomy or construction of an insect are in preparation for an intelligent understanding of the use of insecticidal materials.

On examining an insect you find that practically all of its skeleton is on the outside of the body, with the muscles inside. This hard

outside covering is called chitin, and is impervious to some materials but permits others to penetrate into the interior of the body. Most adult insects have six jointed legs, which distinguishes them from spiders and mites, which have eight legs, or from centipedes, which have many legs.

The insect's heart is a cylindrical tube extending the length of the body just under the back or dorsal surface; there are no true arteries, veins or similar blood vessels such as we have in our human body. The blood flows freely within the heart and the body cavity. The central nerve cord, which corresponds to our spinal cord, lies along the inside of the lower or ventral surface.

Instead of breathing through lungs, via nose or mouth, as do humans and other mammals, insects breathe through holes and tubes in the sides of the body. This fact should be remembered during the discussion of contact insecticides.

The mouthparts of insects are of two principal types: chewing and sucking. In chewing mouthparts, as found in the Japanese beetle, grasshoppers, cutworms and many other pests, the strong jaws come together horizontally and tear out pieces of the leaf tissue, which are then swallowed. In the sucking type of mouthparts, as shown in the aphids, the chinch bug, the squash bug, bed bug and others, the insect cannot chew the leaf surface but has a sharp bill-like structure with which it punctures the leaf surface and sucks up the juices from the cells beneath. It is important that the person who is thinking of buying insecticides should know these mouth differences, as the type of material used largely depends upon the type of mouthpart. Thus a chewing insect actually eats some of the leaf surface, and can be poisoned by arsenicals or other stomach poisons placed on that surface. Sucking insects, with their feeding parts below the surface, get none of these poisons, and must be attacked by some contact material such as oils, nicotine, or some of the other contacticides on the market. These either gas the insect, through its breathing pores. or penetrate the body wall and paralyze the nervous system.

Stomach Poisons. Among the first stomach poisons to be used for insect control was Paris green, which is still used against potato beetles and to some extent against other chewing insects. Because of its tendency to burn more tender foliage, however, other less injurious arsenicals were sought, and lead arsenate was developed.

This material is still used on shade and fruit trees, but because of the possibility of both arsenic and lead residues remaining on the fruit, spraying with such materials should stop before the fruit is ripe, or if used, the fruit should be thoroughly washed before marketing. Recently the tolerance limits for lead and arsenic have been considerably raised. Other stomach poisons which have recently come into prominence are calcium and magnesium arsenates, basic copper arsenate, and the fluorine compounds. There is also a tolerance limit on the last named material.

Other recent developments in this field are the use of tartar emetic for thrips and certain other insects; selenium in the soil solution against red spiders feeding on rose bushes growing in this solution; phenothiazine for screwworm and other fly larvae affecting domestic animals; and also for the internal roundworms of sheep; fixed nicotine compounds for codling moth larvae; several arsenites, thallium compounds, etc., in baits for ants, roaches and cutworms and a long list of new synthetic materials for all sorts of chewing pests. In addition, much work has been done on studying the physiology of many insects, the toxicology of these new insecticides, and many other factors, which will tend to rule out the guesswork of the past. The production of arsenicals, sulfur, oils and similar materials for insecticidal purposes runs into several hundred million pounds per year.

Contact Insecticides. Thousands of materials have been tried out as contacticides, but only a few have met the requirements of killing the insects, not harming foliage or animal life except insects, yet being fairly reasonable in price. For many years nicotine and its compounds have been the chief sprays against sucking insects. Nicotine is derived chiefly from tobacco leaves and is an alkaloid. It acts both as a fumigant and by penetrating the body surface, where it affects the nervous system. The addition of soap or similar material adds to the spreading qualities of this spray. Nicotine, of course, is a violent stomach poison for humans. It is very good against such insects as aphids. Within the past several years other materials very similar to nicotine have been developed and these, with anabasine, a nicotine-like alkaloid derived from a southern European weed, have shown considerable value against sucking pests. The Reviews by McIndoo, Roark and Busbey contain much information on these materials.

Pyrethrum, which was discovered years ago but which has had a rapid development in more recent years, is made from the ground flower heads, especially the achenes, of a daisy-like plant of the Composite family (*Chrysanthemum cinerariaefolium* (*Trev.*) *Vis.* and related species). Apparently the flower heads of our native daisies do not have similar toxicity to insects. The active principles in these pyrethrum heads are esters called pyrethrins; there are two of these: Pyrethrins I and II, which work together. These materials are practically non-toxic to humans, and other warm-blooded animals, but rapidly toxic to many kinds of insects. They affect the nervous system through the surface of the body. Pyrethrum flowers may be ground and used pure as a dust, or mixed with clay or other carrier, or the active principles may be extracted and mixed with the carrier materials. Before the world war most of the pyrethrum was raised in Dalmatia, along the Adriatic seashore in what was later Jugoslavia. During the war the Japanese began to grow it and until very recently have supplied most of the pyrethrum to our markets. Within very recent years attempts to grow it commercially have been made in the United States, even in Pennsylvania, but, while the quality of the flowers is quite good, the labor costs are too high to compete with the cheap labor of Japan. Some attempt is being made to overcome this by developing mechanical harvesters. Pyrethrum is now also being grown in Kenya colony, Africa, and several other places. At the present time most of the house fly and cattle fly sprays on the market contain extracts of pyrethrum in oil (petroleum) base, with essential oils to mask the oil odor. An excellent very comprehensive book on pyrethrum has been published by Gnadinger (1936).

Some years ago the roots of certain plants of the family Fabaceae (Leguminosae) were found to contain a resin from which was obtained rotenone. This material, which was apparently first used as a fish poison and an arrow poison in Malaya and South America, is found chiefly in the plants Derris, Cubé and Timbo (*Tephrosia*); it has also been isolated to some extent from the North American plant, Devil's Shoestring (*Tephrosia virginiana*). Along with the rotenone in these plants are also found certain other rotenone-like materials or rotenoid substances, which appear to be supplementary to the rotenone. These materials are affected by alkalies, light, heat and other factors to which they may be exposed during

these use against insects. Rotenone has been found to be toxic to a large number of insect pests, but also is non-effective against certain others. Its chief use so far has been as dust or spray against Mexican bean bettles, pea aphid, red spider, and similar small pests. Either the derris or cubé root is ground fine and applied as a dust, or the extracted rotenone is incorporated with a carrier such as talc, walnut-shell flour, etc. Rotenone and its derivatives and supplementary materials show much promise of development against additional insects.

Along with the use of plant extractives as outlined above, there has been considerable development of synthetic materials for use as contact insecticides, spreaders, wetting agents, etc. As these have been adequately discussed in Dr. Richardson's and Dr. Roark's recent reviews on insecticides they will not be discussed here.

Fumigants. Dr. Richardson's paper also discusses recent developments in fumigating materials. Among the more important materials now in use are hydrocyanic acid gas, derived from calcium cyanide or from sodium cyanide, sulphuric acid and water, for use against household, greenhouse and mushroom house insects; sulfur dioxide from burning sulfur, for use against bedbugs and certain other household pests; nicotine vapors, from volatilized nicotine or from atomized nicotine, for aphids and similar insects in greenhouses and on certain vegetable crops; paradichlorobenzene against the peach tree borer; chloropicrin, dichloroethyl ether, methyl bromide, and carbon disulphide against soil insects, and insects in stored grains and other products. In addition to the papers by Richardson, the reader should also consult the recent books by Martin and Shepard, and Roark's excellent reviews of publications on nicotine, anabasine, derris and rotenone, and other insecticides derived from plants.

Since it is becoming increasingly difficult to develop new insecticides or to improve old ones without some intimate knowledge of the morphology and physiology of the insects against which these materials will be used, increased effort is being made to study these phases of entomology. Snodgrass (1935) has given a thorough discussion of the morphology of insects; Wigglesworth (1939) has brought together the most important information regarding their physiology, and Hoskins (1940) has added much to our knowledge by his excellent review of papers on how insecticides work on the

various parts of the insect's body. All of these publications contain excellent bibliographies, and should be studied by anyone who is working on insecticides, or who sells such materials.

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"Athlete's Foot." S. D. Epstein. *Soap XVII, 5,* 95 (1941). Among the specific fungi which have been isolated and identified from cultures taken from patients with athlete's foot are the following:

Epidermophyton interdigitale,
Epidermophyton inguinale,
Epidermophtyon floccosum,
Epidermophyton rubrum,
Epidermophyton gypseum,
Epidermophyton cruris,
Trichophyton rosaceum,
Trichophyton purpureum,
Monila albicans.

Of these E. interdigitale or T. rosaceum have been used most commonly as the test organism in laboratory experiments, being considered representative and as resistant to attack as any in the group.

The author recommends an educational campaign for those desiring cure. Failure of one product to bring about the desired results are not necessarily the failure of the product, but the patient's carelessness. The great mistake on the part of the patient is treatment of the feet without any care of the socks and shoes being worn at the time. Socks should be boiled or can be soaked in a suitable fungicidal liquid to free them of the infection. Shoes should be frequently dusted in the toes and heels with a fungicidal powder, or more effectively may be sprayed with a strong fungicidal liquid, provided the liquid is given sufficient time to evaporate completely before the shoes are worn again. Many people reinfect themselves by replacing infected shoes that have been laid aside for some time.

Of three common industrial disinfectants, all having a phenol coefficient of 6 or over, two were less effective than phenol itself. A solution of sodium hypochlorite containing 0.11 per cent. of available chlorine inhibited growth of T. rosaceum in 20 seconds' exposure; 1:1000 dilutions of mercuric bichloride, copper sulfate, zinc chloride, and ammonium alum were non-fungicidal under the test conditions. A five per cent. solution of formaldehyde as well as 1-70 dilution of phenol inhibited growth on 20 seconds' exposure. B. W.

THE EFFECT OF CERTAIN AGENTS ON THE STABILITY OF FERROUS SULFATE SOLUTIONS

With the recent emphasis on ferrous iron therapy the preservation of ferrous sulfate solutions has received considerable attention. The author reports on experiments leading to definite recommendations of interest to all persons who wish to formulate ferrous iron preparations.

By C. Lee Huyck

BECAUSE of the lack of complete data in the literature on the effect of certain chemical agents on the stability of ferrous sulfate solutions, tests were undertaken to determine the efficiency of certain chemical agents and combinations of agents claimed to be of value in stabilizing ferrous sulfate solutions.

Review of Literature

T. Varinski and M. Laska (1) found that ferrous sulfate solutions acidified with sulfuric acid only oxidized 1 to 1.4 per cent. on long exposure to air. A greater quantity of sulfuric acid brought the percentage of oxidation down to 0.1 to 0.2 per cent. The presence of traces of cupric chloride and platinum chloride, however, had a peculiar catalytic action and caused an enormous increase in the rate of oxidation. Hydrochloric acid in large quantities brought about a similar increase in the rate of oxidation.

J. Boselli (2) found that in the atmospheric oxidation of ferrous sulfate in alkaline solutions, copper salts act as positive catalysts while glucose and sulfuric acid act as negative catalysts.

C. Baskerville and R. Stevenson (3) discovered that the ferrous iron is oxidized very slowly in acid or neutral solutions but rapidly in alkaline solutions.

F. Wirth (4) found that the ferrous sulfate crystals are stable when kept in contact with solutions of sulfuric acid in concentrations up to and including 12.5 normal sulfuric acid.

F. R. Ennos (5) passed air and oxygen through a solution of ferrous sulfate at the rate of one liter in three hours. At 25 degrees

C. a 0.1 normal solution of ferrous sulfate oxidized at a rate of 0.03 per cent. per hour and this rate doubled with a rise of 10 degrees in the temperature. At 60 degrees C. the oxidation of the chloride was about one-tenth that of the sulfate and the oxidation of the acetate was ten times as fast as the sulfate. The oxidation depended on the non-ionized portion of the ferrous iron molecule.

J. Eggert (6) observed that oxidation of ferrous sulfate solutions took place by using a platinum stirrer extended out of the solution. The maximum oxidation was proportional to the platinum surface and the length of time it remained in air.

C. G. MacArthur (7) found that sodium chloride, potassium chloride and potassium nitrate have about the same effect on the ratio of oxidation of ferrous sulfate, pyrogallic acid and fructose. Sodium bromide decreased the solubility of oxygen more than the other salts and hence decreased the rate of oxidation to a greater extent. Sodium sulfate and magnesium chloride affected both the oxygen solubility and the rate of oxidation more than sodium bromide. In all the experiments performed a decrease of the rate of oxidation with an increase in salt concentration was found.

With regard to the oxidation of ferrous sulfate solutions Thorpe's Dictionary of Applied Chemistry (8) states: "The aqueous solution slowly oxidizes on exposure to air and deposits a yellowish highly basic ferric sulfate leaving the normal ferric sulfate in solution."

In removing ferrous salts from solution by aerial oxidation J. A. Verhoeff (9) found that the process was catalytically accelerated by the presence of copper ions. The oxidation was found to be much greater in neutral or ammoniacal solutions than in acid solutions. The catalytic effect of the copper on the oxidation of ferrous sulfate was not proportional to the copper concentration.

J. Cornog and A. Hershberger (10) investigated the influence of pH on the oxidation of ferrous sulfate solutions. Upon dissolving weighed quantities of ferrous sulfate in buffered solutions and aerating them for three hours, they found the degree of oxidation of the ferrous sulfate to vary both with the initial concentration of ferrous sulfate and with the pH of the solutions. Little or no iron was oxidized in solutions having a pH less than 5.0. In a solution buffered to a pH of 5 the degree of oxidation increased with in-

creased iron concentration but in a solution buffered to a pH of 10 the degree of oxidation decreased with increased iron concentration.

E. M. Mikbelson (11) found that the addition of sulfuric acid to ferrous sulfate solution retarded its rate of oxidation. The retardation was due to the depression of hydrolysis of ferrous sulfate. Elimination of hydrolysis by the addition of sulfuric acid in proportion to the ferrous sulfate concentration resulted in a proportional increase in its rate of oxidation.

M. C. Lottrup (12) prevented the oxidation of solutions of ferrous sulfate by the use of citric acid but no details were given as to the length of time the ferrous sulfate remained in the ferrous condition.

R. San Martin (13) found that the alteration of aqueous solutions of ferrous sulfate in the air was due to the formation of a basic ferrous sulfate and an equal quantity of sulfuric acid. Alteration ceased after a certain quantity of sulfuric acid was formed. The addition of a suitable amount of sulfuric acid to ferrous sulfate solutions prevented any alteration.

T. O. Martin (14) found that neither syrup nor d-glucose would prevent the oxidation of ferrous sulfate but the addition of dilute sulfuric acid in the proportion of one minim per 5 grains of ferrous sulfate in two fluid drachms of water prevented oxidation.

J. R. Pound (15) reported that platinum black, nitrous oxide and activated carbon catalyzed the slow oxidation of the solution of ferrous sulfate by air and oxygen. At room temperature nitric acid only slowly oxidized the solution. If the concentration of nitric acid was above five-tenths normal the ferrous sulfate was rapidly oxidized.

H. M. M. Mackay and L. E. Jacob (16) claimed the following preparation was stable for two months without precipitation: ferrous sulfate 1½ grs., dilute hypophosphorous acid ¼ min., dextrose 15 grs., chloroform water a sufficient quantity to make 60 minim. The mixture was made by dissolving the dextrose in some of the chloroform water and adding the dilute hypophosphorous acid to it. The ferrous sulfate was dissolved in another portion of the chloroform water and added to the dextrose solution. It was claimed that the ferrous sulfate in the mixture was stabilized by hypophosphorous acid.

The U. S. Dispensatory (17) states that "the aqueous solution of ferrous sulfate is bluish green, but by standing it attracts oxygen

and becomes first green and then reddish depositing in the meantime a portion of sesquisulfate."

Ultrasound of 394,000 hertz units was found by L. R. Solov'eva (18) to catalyze the oxidation of ferrous sulfate solutions by atmospheric oxidation. The greater the sound intensity the more rapid was the oxidation but the proportion was not linear.

H. W. Tomski and L. J. Waller (19) carried out a series of experiments to determine the stability of ferrous sulfate solutions. The solutions were kept in eight fluid ounce prescription bottles under normal dispensing conditions and were estimated at weekly intervals using the Heisig iodate method (J. Am. Chem. Soc., *50:* 1687, (1928)). The following solutions were estimated: ferrous sulfate 2½ per cent, in water, ferrous sulfate 2½ per cent. in 2 per cent. dilute sulfuric acid, ferrous sulfate 2½ per cent. with 20 per cent. dextrose, ferrous sulfate 2½ per cent. with 20 per cent. dextrose and 0.5 per cent. hypophosphorous acid. It was found that all solutions with the exception of those containing dextrose lost ferrous iron at a rate of approximately 1 per cent. per week over a period of ten weeks. With dextrose the oxidation was reduced from 0.6 per cent. to 0.8 per cent per week. A two and one-half per cent. ferrous sulfate solution with 0.2 per cent. citric acid was observed over a period of two months, but fungal growth developed within one week. In an attempt to prevent fungal growth a number of mixtures were prepared. A solution containing 2½ per cent. ferrous sulfate and 0.2 per cent. citric acid with 2 per cent. dilute sulfuric acid remained free from fungal growth. This solution was found to be stable for at least four months. The authors found that the best flavor for this mixture was lime juice 6 per cent., dextrose 20 per cent., essence of pineapple 0.125 per cent. and oil of lemon 0.025 per cent.

J. Milbauer (20) found that mannitol acted as a negative catalyst and reduced the rate of oxidation of ferrous sulfate in concentrated sulfuric acid solutions. Sorbitol did not have this property.

U. P. Basu and S. C. Chowdhury (20) discovered that ferrous sulfate solutions containing 30 cc. glycerin, 60 cc. syrup and 2.2 cc. hypophosphorous acid showed almost no production of ferric iron on standing a year. The ferric iron increased slightly the first five days and then remained nearly constant with a very slight increase the rest of the year. Solutions of ferrous sulfate containing

sulfuric acid and hypophosphorous acid but containing neither syrup nor glycerin showed progressive and extensive production of ferric iron throughout the year. A solution of ferrous sulfate was found to be more stable than a solution of ferrous chloride.

D. A. Clarke (22) prepared a mixture of ferrous sulfate according to the formula of Mackay and Jacob (15) and found it to be stable from six to seven days. Sugar alone was thought to protect ferrous sulfate from oxidation and the length of the period of protection should be directly proportional to the amount of sugar present. In comparing the efficiency of various concentrations of sugar in stabilizing ferrous sulfate solutions, 80 per cent. prevented precipitation for a period of three to four weeks. At the end of this time ferric hydroxide was formed. By slightly increasing the acidity with the addition of 0.2 per cent. citric acid, the sample did not precipitate for about ten months. The author concluded that for all practical purposes this degree of stability was satisfactory.

Experimental Procedure

A series of ferrous sulfate solutions containing 2.2 per cent. U. S. P. crystals and 0.02 per cent. n-butyl p-hydroxybenzoate to prevent fungal growth were prepared with the addition of various stabilizing agents. No. 1 was used as a control, No. 2 contained 40 per cent. technical dextrose, No. 3 contained 0.2 per cent. hypophosphorous acid, No. 4 contained 40 per cent. technical dextrose and 0.2 per cent. hypophosphorous acid, No. 5 contained 0.1 per cent. citric acid, No. 6 contained 0.1 per cent. citric acid and 40 per cent. technical dextrose. The solutions were stored in eight-ounce plain glass prescription bottles at room temperature stoppered with a pledget of cotton. The solutions were assayed directly after preparation and at weekly intervals for six weeks. They were then assayed at monthly intervals until a period of six months had elapsed from the time of manufacture. A ceric ammonium sulfate method of analysis was used, viz., 5 cc. of solution was diluted with 15 cc. of distilled water and acidulated with 1 cc. of diluted sulfuric acid. The solution was titrated with ceric ammonium sulfate with the use of 1 drop of orthophenanthroline ferrous complex as indicator. The ceric ammonium sulfate tenth normal volumetric solution was prepared and standardized according to the method given in the Bulletin of the National Formulary Committee (23). The analytical results given

below are the average of two determinations expressed in grams per 100 cc.

TABLE No. 1

Amount of Ferrous Sulfate in Gm. per 100 cc.

Time in Weeks	No. 1 (Control)	No. 2 (40% Tech. Dextrose)	No. 3 (0.2% HPH_2O_2)	No. 4 (40% Tech. Dextrose and 0.2% HPH_2O_2)	No. 5 (0.1% Citric Acid)	No. 6 (40% Tech. Dextrose and 0.1% Citric Acid)
After Prep.	2.20	2.21	2.21	2.24	2.24	2.24
1	2.21	2.22	2.07	2.20	2.13	2.18
2	2.18	2.18	2.04	2.24	2.18	2.18
3	2.18	2.21	1.97	2.19	2.11	2.18
4	2.11	2.19	1.93	2.19	2.11	2.18
5	2.11	2.18	1.92	2.18	2.11	2.18
6	2.08	2.21	1.92	2.24	2.05	2.18
10	1.98	2.21	1.92	2.24	2.01	2.18
14	1.98	2.21	1.92	2.24	2.01	2.18
18	1.98	2.21	1.92	2.19	2.01	2.18
22	1.98	2.18	1.90	2.20	2.00	2.19
26	1.98	2.18	1.90	2.20	2.00	2.19

TABLE No. 2

Percentage of Deterioration After a Period of Six Months

No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
10.0%	1.3%	14.0%	1.7%	10.7%	2.2%

Summary

The results indicate that hypophosphorous and citric acids are inefficient in stabilizing the ferrous sulfate solutions in the concentrations used. Technical dextrose and technical dextrose with hypophosphorous acid seemed to be quite efficient in stabilizing ferrous sulfate solutions that were exposed to air at room temperature over a period of six months. These results are in general agreement with the results of H. W. Tomski and L. J. Waller (19).

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THE CONSUMER,—BLOODY BUT UNBOWED

The day of unintelligent consumer buying is gone. The government is taking a rightful interest in seeing that its people get both protection and a fair deal. Progressive manufacturers have already sensed this and are taking steps to cooperate. Although you may not agree with all the arguments of the author you cannot but be intrigued by his facts and figures.

By T. Swann Harding

THE other night there was a radio discussion on the merits, and otherwise, of giving consumers honest, fully informative information on labels and in advertisements. Two manufacturers, an officer of a private consumer rating agency, and a home economist participated.

In general the manufacturers contended that consumers were already getting more truthful information in labels and advertising than they could absorb or appreciate, though ethical manufacturers were willing to give still more, if it would be of any use. The other two participants felt that information given consumers lacked considerable both in fullness and in common honesty, and that consumers would appreciate much more as an aid to intelligent buying.

One of the manufacturers said people paid almost no attention when he gave complete information about his blankets on special test labels. It was suggested that perhaps the information was too technical to register effectively with the average layman. The representative of the private rating agency was asked how many people cared to pay a fee to get ratings of consumer goods, and it appeared that a hundred and fifty thousand at the outside were interested. This, of course, does not condemn consumers as ignorant; it mainly indicates that no private agency set up to evaluate the tremendous flow of consumer goods for a small fee can possibly do an efficient job. The number of commodities and the technical difficulties prevent that.

However, consumers and consumer information do assume enhanced importance just now when we have tied our regular economy to a military economy, and prices are bound to rise, sometimes spectacularly. Regardless of what the Defense Advisory Commission and its successors may do, consumers are bound to suffer increasingly

as time goes on. Since incomes will not keep pace with prices every effort must be made to prevent fraud and unwarranted price rises. Giving consumers such information as will enable them to buy economically is one way of raising their incomes.

Certainly the information manufacturers and advertisers have usually considered sufficient in the past is not enough. Turn to *Printers' Ink* for December 6, 1940, and you find an erudite discussion of what advertising did for sales of a certain brand of coffee in a certain city. This was ascertained by comparing its sales with those of unadvertised brands, after the roaster decided to expend about $12,000 in a newspaper publicity campaign.

He fired off $4428 of this the first month, $3327 the second, $1187 the third and so on down to his last shot of $524 the sixth month. What was discovered? Sales did not respond immediately; there was a lag, but they did attain great heights in the fourth and fifth month of advertising. The roaster then tried a price cut; sales spurted enormously the next month, then dropped abruptly, so a price cut was esteemed less valuable as a sales stimulant than continuous advertising.

As a matter of fact the coffee roaster had spent three-fourths of his advertising appropriation to get only a 25 per cent. increase in sales—but ultimately sales increased fourfold. Hence there was what the advertising technician called a "cumulative effect of brand acceptance," a "delayed response of the public," and also a "delayed lag" when advertising stopped. Five months after the advertising and price cutting were all over sales had returned to where they were after only two months of advertising . . . and so on.

Now, that is the way the roaster and advertiser think about coffee. But what has that to do with the consumer? Not a word was said throughout about the relative qualities of the coffees, though numerous studies have shown that well-advertised brands of food are often inferior in quality and higher in price than unadvertised and relatively unknown brands. All this study shows is that you can seduce consumers into buying almost anything, good or bad, if you just keep machine-gunning them with advertising.

No wonder the consumer is bewildered. In 1935 he had offered to him (or her) 10,000 brands of wheat flour, 4500 of canned corn, 1000 of canned salmon, 87 different breakfast foods, 46 mixed flours, 96 packaged butters, 101 packaged teas, and canned fruits and vege-

tables in endless array and in four or five different—mostly meaningless—quality grades.

A Milwaukee survey of 5000 families made in 1930 disclosed that they were purchasing 256 different brands of toothbrushes, 164 brands of fountain pens, 110 of electric washers, 101 of packaged coffee, 93 of packaged butter, 87 of breakfast food, 77 of cleansing powders, 76 dentifrices, 73 shaving creams, 68 mouth washes, 65 ginger ales and 65 different brands of toilet soaps. Now, when each manufacturer assures the public in advertising that his brand is decidedly the best, what is a poor consumer to do? Do you realize that the average modern mail-order catalogue offers from 50,000 to 60,000 different choices, and that there are some 350,000 different items in the average department store?

Suppose a smoker wanted to find the "best" cigarette? How much would advertising and labels help him? The tobacco in every cigarette commonly comes out of several barrels each containing tobacco of a definite type. The combination of these types determines the blend or flavor of the cigarette, and a buyer calls for the combination that pleases him most. That is really all there is to it scientifically, as the Agricultural Marketing Service tells us. The "best" cigarette is the one you like.

Since 172 billion cigarettes were smoked in 1939, about 1300 per person including babes in arms, somebody evidently liked some of them. But sweeping claims made by manufacturers of cigarettes are almost wholly pseudo-technical hocus-pocus. For that matter Turkish tobacco comes as often from Greece, Bulgaria, or some other Mediterranean country or island as from Turkey, and it is simply an aromatic, light-colored, air-cured type.

That consumers need to buy as economically as possible becomes tragically apparent when you consider how much they have to buy with. In 1935-6, for instance, income ran $469 per person or about $9 a week. But 116 million consumers lived in 29½ million families with annual incomes of $1622 or less, which is about $31 a week. The income of a median family in the aristocratic "upper third" was $41 a week, in the middle third it was $21 and in the lower third only $10. Two-thirds of our families received $1500 or less per year and the top tenth had 18 times as much income as the bottom tenth. But the income of the bottom tenth had to support 62 times as many families as did that of the top tenth. Catch on?

We are talking about the United States, not some impoverished Central European satrapy of a dictator. Meanwhile something like $2 billion of advertising propaganda is blasted down upon these American families every year. This propaganda is designed not only to offer goods for sale but to create artificial demand for superfluous commodities in many instances. In some lines, the drug and toilet goods for instance, over 27 cents is spent on advertising per $1 of wholesale price!

Now, consumers are not Communists, nor even dirty rats, just because they want their advertising honest. In *Printers' Ink* for November 29, 1939, C. B. Larrabee said that organized consumer groups gained in membership while advertisers beat the bushes in witch hunts. He said it was entirely wrong to assume that something was silly just because a consumer suggested it, and went on that the loudest opposition to consumer demands came from certain companies that had no business to be in business in the first place.

Informative labeling was a good thing and many concerns had adopted it voluntarily. Any advertiser who thought he could demolish consumer resistance by engaging in a witch hunt had, according to Larrabee, entirely missed the point. About the same time Alfred T. Falk, of the Advertising Federation of America, was telling the One Hundred One Club in New York City that consumers simply wanted information which would enable them to spend their dollars more effectively, and that manufacturers and advertisers should give greater consideration to their legitimate needs. Very similar sentiments were expressed also by Edgar Kobak, Vice-President of Lord & Thomas, speaking before the Associated Grocery Manufacturers of America October 30, 1939.

On the other hand there has been resistance to honest labeling and there have been numerous attempts to clean up simply by making people pay for words—trade-marks. Medical journals frequently publish the prices of certain well-known drugs and chemicals which are sold at very reasonable prices under their own names but which are priced extortionately the minute they adopt an advertised trade name. The same thing is true of common bathroom medicine-cabinet supplies as a big New York department store showed in its advertisements during 1938.

In each case the quality and the quantity of the product were the same. Yet whereas 16 fluid ounces of U. S. P. mineral oil could be purchased for 29 cents the advertised brand ran 69; boric acid was

27 cents a pound under its own name and 57 under a trade name; aspirin tablets U. S. P. were 18 cents per 100 (5 grain) but under a trade name they cost 59 cents a hundred; a good 24-ounce tube of toothpaste sold for 19 cents with no false claims, but a tube of identical size and composition under a trade name was 39 cents, with false claims!

Packers and wholesalers have for quite a while sold canned goods under quality labels which they fully understood. They simply had to do that to reach any equitable agreements on prices at all, but the retailer and the consumer usually bought in the dark and often found that the higher-priced, better-known product was inferior. In May, 1934, it was announced that the canned-foods division of the Commercial Exchange in Philadelphia was setting up an organized market in such foods with full facilities for grading, sampling, and so on.

The basic grade used was U. S. Government Grade C or standard; Grade B, extra standard, was optional for delivery without premium, and Grade A, fancy, was deliverable at a premium above the price at which the transaction was effective. Thus it appeared that such grades had very definite monetary meanings for middlemen though many canners contend they would lack meaning for consumers.

According to *Business Week* for December 8, 1934, the Great Atlantic and Pacific Tea Co. decided about that time to extend the benefits of grading to consumers by using such quality designation as A, B, or C, corresponding to fancy, choice, and standard. Yet at this very time many American canners were fighting the idea of incorporating provisions for quality standards in the new food and drug bill then under discussion. But effective grade-labeling regulations have been used in Canada since 1918 and they work well.

Canadian industry favored this legislation as it promoted uniformity of product. Our National Canners Association contended that such regulations would reduce grades to one price level, result in only minimum grade requirements being put up, cause losses in advertising lineage, decrease the importance of brand names, and be too costly. None of these objections materialized in Canada, though it was a fact, as a survey showed, that Canadian housewives were rather too unfamiliar with the significance of the grading regulations.

Our own tendency to grade canned goods A, B, and C is based on Department of Agriculture standards which it uses in its inspection service. The grades, in turn, result from a scoring system predicated on the judgment of experts. There is room also for putting

precisely defined or measured physical or chemical properties on the labels when possible. But consumers do not yet seem to be agreed as to the relative importance they would attach to factors which determine quality—such as tenderness, flavor, consistency, etc.—some of which are rather intangible.

Libby, McNeill and Libby started using descriptive labels for canned goods voluntarily, not long ago. Their labels for mixed vegetables give the percentage of each vegetable present, the size of the can, the net weight of contents, and also the number of servings. In 1937 the company felt that grade labeling was inadequate. However, they utilized pictures which accurately presented the type of fruit or vegetable in the can, and the labels also bore such statements as: Approximately 8 to 11 halves of peaches of uniform size packed in heavy syrup.

Business Week for December 28, 1940, announced a strong voluntary movement on the part of certain canners to pay for the inspection service required and adopt Department of Agriculture grades for their canned goods. The movement threatened to spread faster than the Department could provide inspectors. The big canners who had fought grade labels were reluctant to talk about this movement or to say what they would do. But it was realized that if grade labels ever became general the early birds would reap the biggest benefits.

The voluntary movement tended to enlist packers with no trademark investment at stake. They now decided to use labels for the time, and to parade Government certification of the grades to win prestige among consumers! Opponents were still pointing to the fine quality of trade-marked goods (though quality is not rationally related to price here) and saying people would not buy lower grades, thinking them unwholesome.

The fact remains that consumers both need more information than they get and need to learn that they do need it. A careful reading of advertising and selling magazines indicates that manufacturers see this necessity and begin to agitate themselves about it.

For instance, there was an editorial in *Printers' Ink* for September 27, 1940, entitled "Cafeteria Selling." It attributed to consumer agitators a new type of merchandising built on informative labeling. These improved labels, it said, bettered relations with consumers, stimulated specification buying with resultant savings, pointed the manufacturer the way to reduce his number of lines, and put a new type of salesmanship at the retail counter.

For no matter how honest and informative the manufacturer might be to the wholesaler and to the retailer, his message might be entirely bungled or garbled by stupid sales people when it came to the consumer. If, however, the manufacturer was fully and honestly informative both in his advertising and in his labeling, that information would reach the ultimate consumer, and would provide a far more intelligent message than the average sales person could be depended upon to provide.

This would enable the consumer to do "cafeteria buying" and to make his own comparisons. The thing of interest here is that when manufacturers and advertisers can see commercial advantage in giving the consumer honest information we may expect progress. There is urgent need for this when you remember that the Federal Government is said to save a hundred million dollars a year by specification buying and that the Bell Telephone Co. saves $50,000 annually on the specification purchase of $150,000 worth of lead pencils!

Fully informative advertising and labeling would result in making competition take place in terms of something tangible and stable, not in terms of an unstable, variant factor like price. This would go far towards ending the "returned-goods" evil, which causes sellers a loss estimated as $100 million a year. Stable grades, precise labels, and definite standards would enable consumers to buy what they want for particular purposes. They could get grade D when they wanted grade D without prejudice to higher grades.

Advertised brands would not suffer at all, if they were good. They would stand squarely on quality, not just pretend to do so as at present. The consumer is still largely gagged in a mass of pseudo-technical detail and pseudo-scientific information which is all really propaganda. That is partly because consumers are an amorphous group facing organized manufacturing and selling agencies. Industry is gradually discovering that the use of definite standards pays.

Sears, Roebuck find that their sales jump every time they use a definite standard in their catalogue. Certain powerful firms have built up valuable equities in brand names, to be sure. They pretend to fear that grade labeling will jeopardize their goods, but this could scarcely occur if the commodities are of high quality. The Government's stake in all this is large, particularly so with us in the midst of a defense program.

Now, of all times, industry must be stabilized for consumer benefit and consumer buying power must be increased by the reduction of waste and mistaken buying.

A PERFUSION TECHNIC FOR THE EVALUATION OF BACTERICIDES BY THE TISSUE CULTURE METHOD

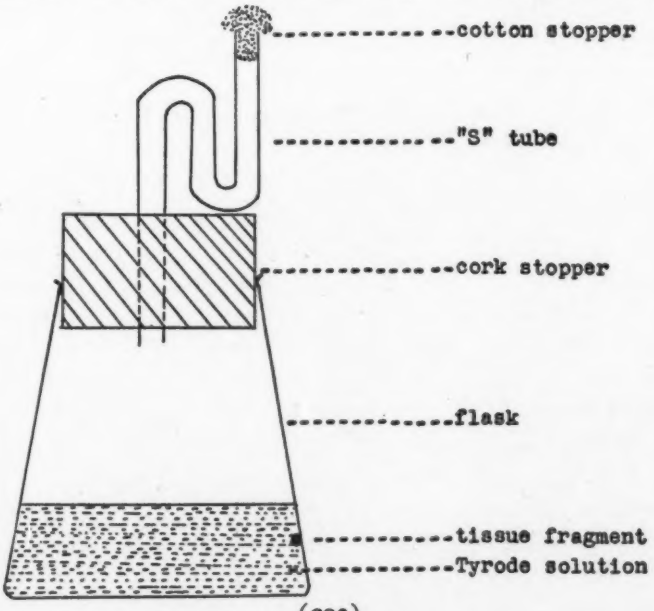
By Bernard Witlin

IT has been suggested that a more accurate method of evaluating bactericides for clinical use is possible by testing their efficiency on living tissue as well as noting their ability to kill bacteria in vitro. This observation has been stressed by Lambert and Meyer (1), German (2), Buchsbaum and Bloom (3) and by Salle and his associates (4). The plasma-clot technic, which was employed in all instances (1, 2, 3, 4), used fragments of chick heart from 9-day-old embryos embedded in guinea pig plasma, in Carrel flasks. The plasma, after coagulation, was washed with Tyrode solution to remove the guinea pig serum, after which various dilutions of the germicide in embryonic fluid were added.

In an effort to develop a simple and comparable procedure the following perfusion method was employed:

Tissue Culture (General Method)

Employing an aseptic technic throughout, the heart of a 9-day-old chick embryo was removed with iridectomy knives, rinsed in Tyrode solution and sectioned into 0.5 to 1.0 mm. fragments. The fragments were then transferred on the tips of the iridectomy knives and allowed to adhere to the sides of 50 cc. wide-mouthed pyrex



Erlenmeyer flasks (one fragment per flask). The Erlenmeyer flasks contained cork stoppers with ⅛-inch diameter glass "S" tubes, cotton plugged at one end and leading through the cork for ventilation.

The flasks were then tilted so that the tissue fragments were on the uppermost side. Twenty cc. of the desired dilution of the bactericidal agents were pipetted into their respective flasks. Merthiolate and Metaphen noted in the findings were the marketed Tinctures; Hexylresorcinol was the marketed S. T. 37 Solution and Zonite was the preparation marketed under this name. Dilutions of these agents, of tincture of iodine and of the other bactericides listed (marketed as solids) were made with Tyrode solution containing 5 per cent. embryo extract (5) as the diluent. The stoppers were inserted and the flasks gently uprighted, so that the tissue was completely covered by the bactericide-Tyrode-5 per cent. tissue extract solution. The perfused tissue was then placed in an incubator for 48 hours at 38.5 degrees C.

After incubation, the fragments were removed from the flasks with sterile 14 gauge platinum spoons (5), imbedded in chicken plasma on cover slips (22 x 40 mm.), mounted on hollow-ground slides and examined under the microscope for growth. The highest concentrations at which the bactericides did not inhibit the growth of the living chick-heart tissue were noted.

Comparative tests employing a plasma clot technic (4) were run simultaneously.

Table of Results Indicating Weakest Dilution of Bactericide Inhibiting Growth of Heart Fragment

Bactericide	*Perfusion Technic*	*Plasma-Clot Technic*
Phenol	1:1,250	1:1,200
Hexylresorcinol	1:21,000	1:21,000
Mercuric chloride	1:45,000	1:45,000
Mercurophen	1:30,000	1:30,000
Merthiolate	1:180,000	1:175,000
Metaphen	1:76,000	1:75,000
Mercurochrome	1:10,500	1:10,500
Argyrol	1:3,500	1:3,500
Cargentos	1:3,500	1:3,600
Tincture of Iodine USP XI	1:2,000	1:2,500
Zonite	1:4,000	1:4,000

It may be noted that the degree of variation between the perfusion and plasma-clot technics are but slight in a few instances. This may be accounted for by the difference in the preparation of the tissue extracts or due to a slight deviation in the technic.

Summary

A simple perfusion technic as an accurate method for evaluating the toxicity of bactericides is presented. This was compared with the plasma-clot technic employing eleven commonly-used antiseptics.

Conclusion

From the results obtained it is reasonable to conclude that the perfusion technic findings are in harmony with those obtained by the plasma-clot methods reported by other workers (1, 2, 3, 4). The perfusion technic is to be preferred on account of the ease in performing it and its comparative low cost.

This presentation is to be followed by an article on the effect of concentration and time variation on tissue exposure to bactericidal agents.

Acknowledgment

The author wishes to acknowledge the valuable suggestions of Dr. Louis Gershenfeld in the preparation and presentation of this paper.

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OUR CONTRIBUTORS

T. Swann Harding, B. S., Editor of Scientific Publications of the Department of Agriculture occupies a position which affords him an opportunity to survey the thoughts and acts of the entire field of public health as well as economic trends. This journal welcomes the opportunity to present his views which we feel are refreshing, interesting and relevant.

C. Lee Huyck, Ph. D., of the research staff of Wm. S. Merrell Company, Cincinnati, Ohio, presents this month the results of another problem in pharmaceutical research.

C. A. Thomas, B. Sc., is associate professor of entomology of Pennsylvania State College. Now located at the Pennsylvania State Experimental Station at Kennett Square in Chester County, Pennsylvania, he is actively engaged in insect control studies. The famed Longwood Gardens and the extensive mushroom industry in this area provide ample opportunity for his work.

Bernard Witlin, D. Sc., a frequent contributor to this journal, is a bacteriologist engaged in both teaching and research. He is a member of the faculty of the Philadelphia College of Pharmacy and Science.

SOLID EXTRACTS

Prepared by the Editor and his Staff

Heretofore, about half the people taken to hospitals suffering from tetanus have not recovered. Now, thanks to a new mode of treatment, reported in the Journal of the American Medical Association, this death rate has been reduced 50 per cent.

Every case, regardless of its severity, is treated in the same manner. First, and immediately, chloral hydrate is administered. In an hour, 20,000 units of antitoxin are injected around the site of infection, and, an hour later, the wound is opened and thoroughly cleansed. If amputation is necessary, 60,000 units of antitoxin must be injected before, and 20,000 units after the operation. In case of a fever, additional injections are required, together with intravenous use of methenamine. Totally, 200,000 units of antitoxin must be administered within twenty-four or thirty-six hours, and the patient must then be allowed to have utmost quiet, to enable the new procedure to produce results.

AJP

Scientific research indicating that bacteria in the mouth quickly convert refined carbohydrates into acids simply confirms the existing popular belief that the best time to clean teeth is immediately following meals, even though the taste of tooth paste is less desirable than the lingering oral remembrance of apple pie or macaroni and cheese.

AJP

Other research workers have gone to great length to corroborate a second common-sense popular idea that the best time to insure good teeth for life is in childhood. They have pointed out that dental caries begin on the outer surfaces of the teeth and must be caused by some external factor. Tiny cracks in teeth are the starting places for these cavities. Saliva is the only body fluid coming in contact with the teeth. Therefore, constantly clean surfaces kept intact through good infant feeding with a diet that does not impair the acid-neutralizing power of the saliva will do much to keep the dentist from becoming too much of a "bore."

Streamlining has overtaken the modern toothbrush. Today, more than 95 per cent. of toothbrush handles are made from plastic, and many of these dental cleaning instruments are being bristled with nylon filament.

AJP

Streamlining of airplanes is also commonplace, but a new and interesting development along this line is the use of synthetic acrylic resin, better known as plexiglas, for windows and noses in bombers. Transparent, this product can be sawed and carved like wood and drilled and threaded like metal. It can be molded into shapes bigger and more complex than is possible with glass. Although it is not bulletproof, it can withstand rather hard blows and great pressure. When it is fractured, it breaks into pieces that do not cut.

AJP

Man is master of the air, but his conquering contrivance, the airplane, has grown to be stronger than its originator. The marvelous machine that evolved from the Wright brothers' first flight at Kitty Hawk has developed so fast and so far that human operators must be at the top physical notch to make it perform efficiently. Rapid ascents, long periods of flight, dive bombing and many other mechanical accomplishments inspired by modern warfare have made the flying machine almost perfect, and still capable of further development, but the human body cannot keep pace. The complexities of the controls of today's fighting plane is a tax upon even the most rugged and alert aviator, for the human mind and the human heart can stand just so much. The problem, then, according to medical and aviation experts, is to retain the modern plane at its present stage of development and cultivate a race of men capable of adequate command.

Watching a flying plane at night, one is taken with its resemblance to a huge meteor. That, of course, is from the point of view of a person who has not made a specialty of astronomy. Even those who dabble in this field of science might make the same mistake, for there have been so many meteors and rumors of meteors that it has been slightly confusing—until a professor at the University of Pennsylvania presented the American Philosophical Society with a complete catalog of all meteors from 32 B. C. to date. After culling through many thousands of reports and texts, 1336 authentic meteors in a period of 1973 years were listed as having trains which lasted for at least a minute.

AJP

Time not only evaluates the catalogability of a meteor, but it cures all ills, according to a "headache machine" vendor in the unsuspecting city of Camden, N. J. Sold for $5, the dissected piece of mechanism turned out to be a clock and an egg beater under an inverted glass. The beater was run by a motor, and the entire outfit was encased in plaster. Needless to say, the purchaser netted nothing but a new type headache.

AJP

Physicists are undecided as to whether the cyclotron or the electron microscope is to be termed the greatest recent achievement in that field. Whichever would win should a concensus be obtained, the world will be the better for artificial radioactivity and also for the widespread fields of research being opened by the electron microscope. This instrument, seven feet high and weighing almost 500 pounds, makes possible magnifications of 100,000 diameters and affords greater resolution than the ordinary 'scope now in general use. These instruments now cost $9500 each.

BOOK REVIEW

Candid Opinions of the Latest Scientific Volumes

Corner Druggist. By Robert Nixon, Jr. (Prentice-Hall, Inc., N. Y.) Cloth bound, 291 pp.

This very enjoyable book was written by the son of a man who spent his life as a Corner Druggist. Both the fine qualities and the faults are recorded. The druggist is depicted primarily as a man of high ideals, rosy dreams and strong convictions, who spent his life either serving humanity over the counter or else arguing with the customer on any topic whatever. Both of these he did well. His arguing even carried him to the point of being an inveterate letter writer to newspapers. He loved people and spent his life loving them and helping them. A drifter, he moved at least forty times and never seemed to settle down anywhere for very long. A dreamer, he never lost hope that one of his inventions would some day bring him fame and fortune.

More delightful than anything else however is the atmosphere and flavor of the old time drug store. Innumerable descriptions and incidents constantly add to this feeling. Captured also is the romance and mystery of pharmacy not only of his time but also of the several thousand years preceding him. Many also are the day by day over the counter experiences related. As a matter of fact most of the book seems to be a collection of everyday incidents and experiences draped over a hazy frame of a more or less orderly chronological sequence. A generous sprinkling of well told but somewhat salacious stories are related and with a mirthful though guilty twinkle in the teller's eye. Constantly in the background also is the picture of the druggist's wife, lonely, hard working, almost always dollar-stretching, but ever inspirational and understanding. The reader feels keenly with the druggist the little successes and failures, his intense interest in people, and the high level of his code of professional ethics. The corner druggist here depicted may have been a failure as far as his financial success was concerned, but spiritually he was indeed wealthy.

W. T. F.